

IKONOS IMAGERY GROUND CONTROL POINT SURVEY

April 6, 2005

April 8, 2005

U.S. Department of Commerce National Oceanic and Atmospheric Administration
National Ocean Service
National Center for Coastal Ocean Science and
National Geodetic Survey

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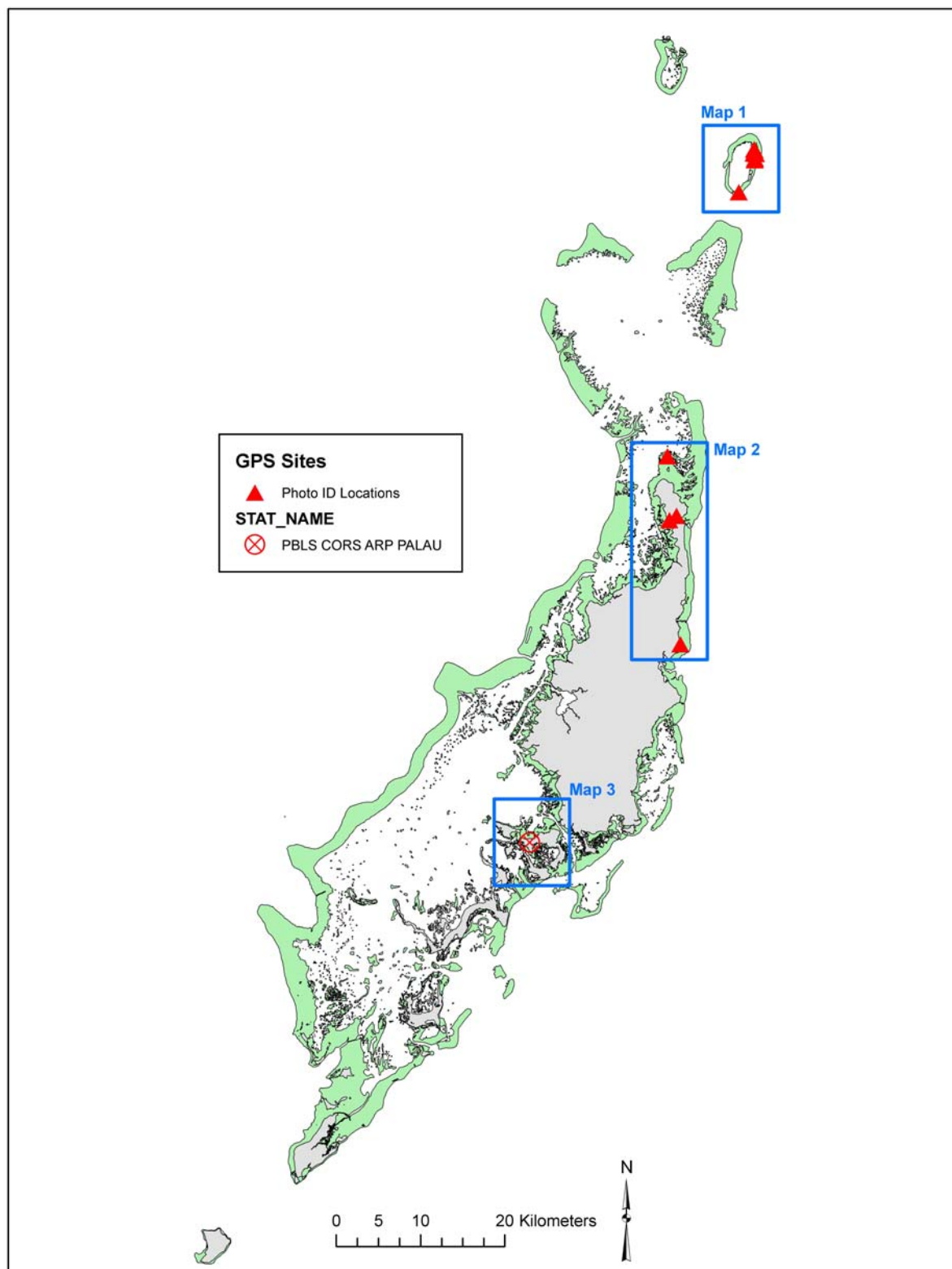
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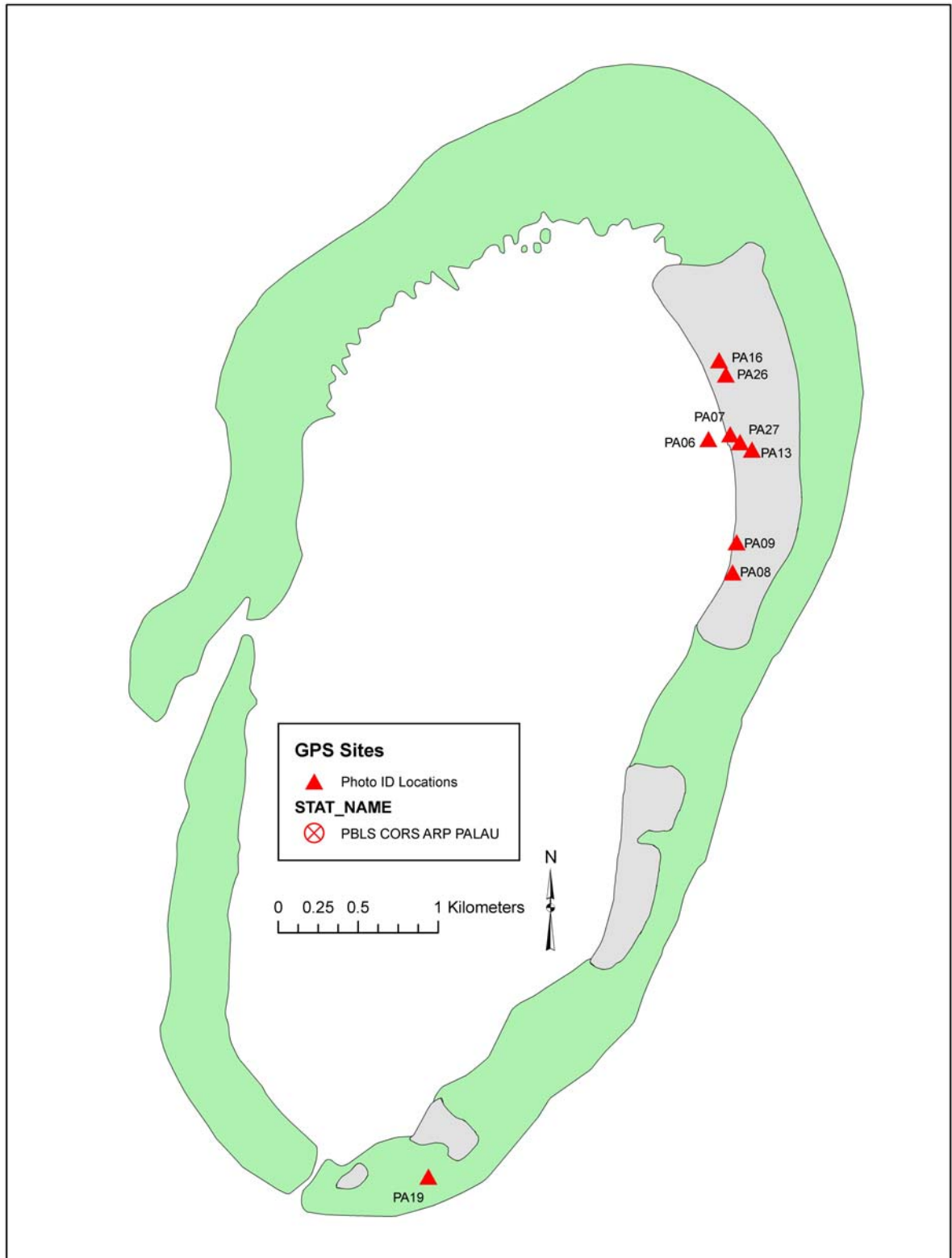
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May 11, 2005

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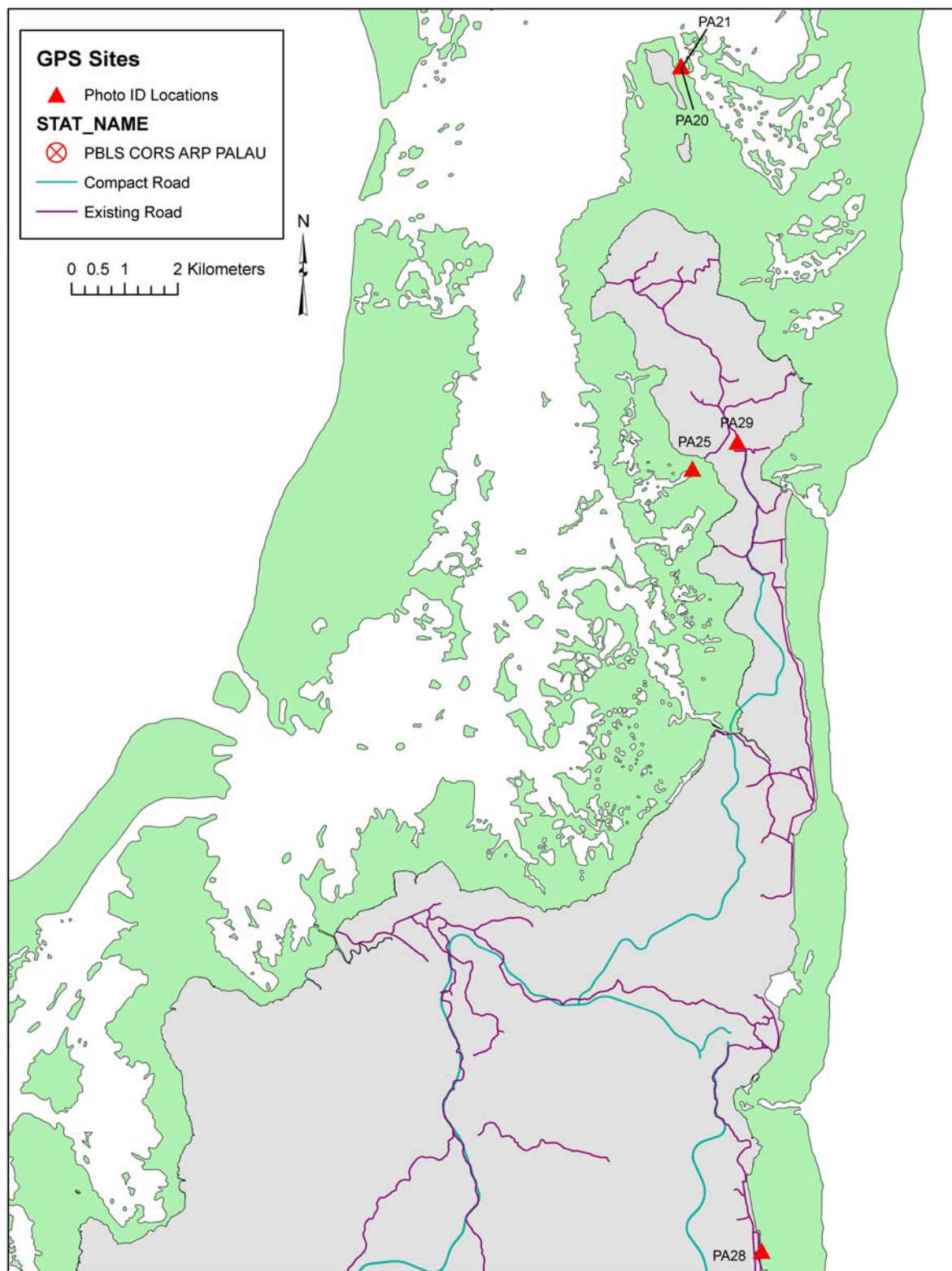
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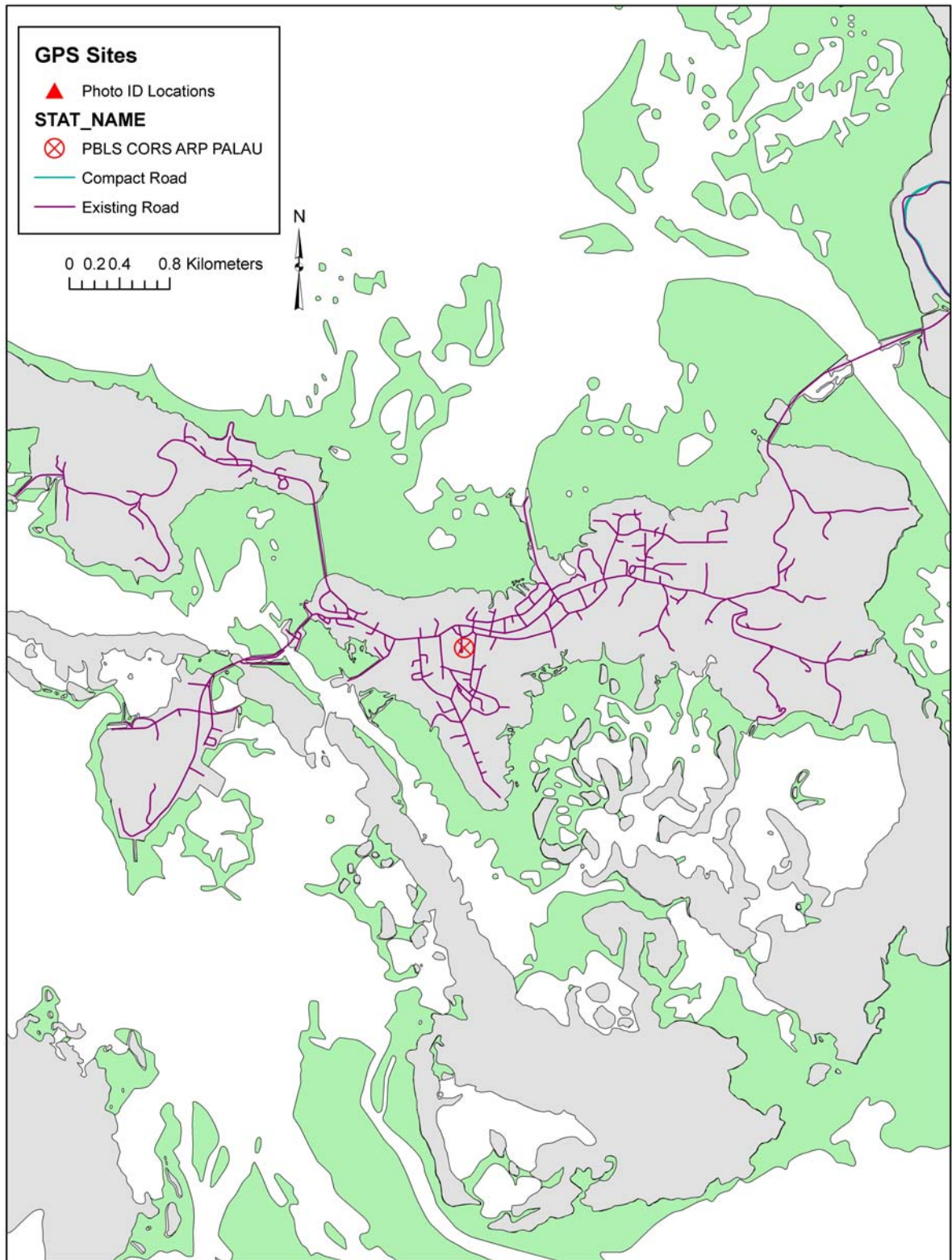
index_map.jpg



map1.jpg



map2.jpg



map3.jpg

Mission Project Summary

NOAA NOS and POLARIS staff conducted fieldwork in the Republic of Palau to collect Ground Control Point (GCPs) using dual-frequency survey grade GPS receivers to be used in orthorectifying IKONOS satellite imagery. Fourteen GCP points were selected for GPS occupation based on the ability to detect the location in the imagery available, accessibility by land and boat, and GCPs being contained within the study region. NOAA NOS and PALARIS had conducted a similar effort in 2003 for use in orthorectifying imagery for Babeldaob and the islands as far south and Anguar. The mission conducted in 2005 focused on the most recent IKONOS imagery covering the northern end of Babeldaob and extending to the Ngarangel Reef.

Each GCP site was occupied for at least twenty minutes using an Ashtech ZExtreme with a Geodetic IV Antenna without a ground. The GPS observations were at 5 second epoch rate and 10 degree elevation mask. Each GCP occupation was documented with at least three digital photos taken from multiple directions. A GCP station sketch was also recorded at the time of occupation. Finally, the GCP position was located and captured at sub-pixel resolution in the IKONOS 1-m panchromatic imagery while in the field. The GPS vectors were post-processed using the program GPSurvey version 2.35 and NGS' program ADJUST did the final network adjustment. GPS observations were adjusted using the Trimble base station (PBLs CORS ARP Palau) located at PALARIS is Koror, Palau. An analysis of the residuals transformed to the local coordinate system (n,e,u) was performed as a final measure of consistency. The computed root-mean-squares (RMS) of these residuals were only 17.4 cm in latitude, 38.2 cm in longitude, and 129.0 cm in geodetic (ellipsoidal) height for the survey.



GCPs were selected so as to be identifiable and accurately locatable in 1-meter GSD (Ground Sample Distance, or projected pixel size) satellite imagery. This means that they must be situated within or at the boundaries of ground features with local panchromatic contrast sufficient to identify accurately the GCP's pixel coordinates in an image (to within an error of 0.33 pixels, 1-sigma). Thus, high contrast objects are most desirable. Ideal features were selected on nearly horizontal terrain, so shadow and perspective influences upon the GCP pixel location measurement will be negligible. The GCPs were situated well away from any obstacles which might block their view in imagery collected at any elevation angles from 40 to 90 degrees (within 50 degrees of zenith). Also, they were selected to be durable in the scene, having an expected lifetime of several years with position and visibility retained. Possible cultural features were sidewalk intersections, piers, road intersections, airport runways, basketball courts and other athletic fields, and the like. Possible natural features would be large (several meter) boulders. The spatial distribution of points was maximized to the extent possible. Further, multiple points were selected along seamlines between imagery acquisitions and the seamline between the most recent and previous imagery products to ensure spatial co-registration. Additional "Check points" were collected which will be withheld for use in the softcopy orthorectification solution so as to assess the accuracy of the derived imagery product with actual field measurements.

Ngerechur Jetty, Ngarchelong

Date (UTC): 096

Northing: 857371.647

ID: PA20

Easting: 458478.271

Description: Carbonate rock jetty at the rock water interface. T-shaped jetty. Point 17.2 ft from east edge of rubble and 25.7 ft from PA 21.



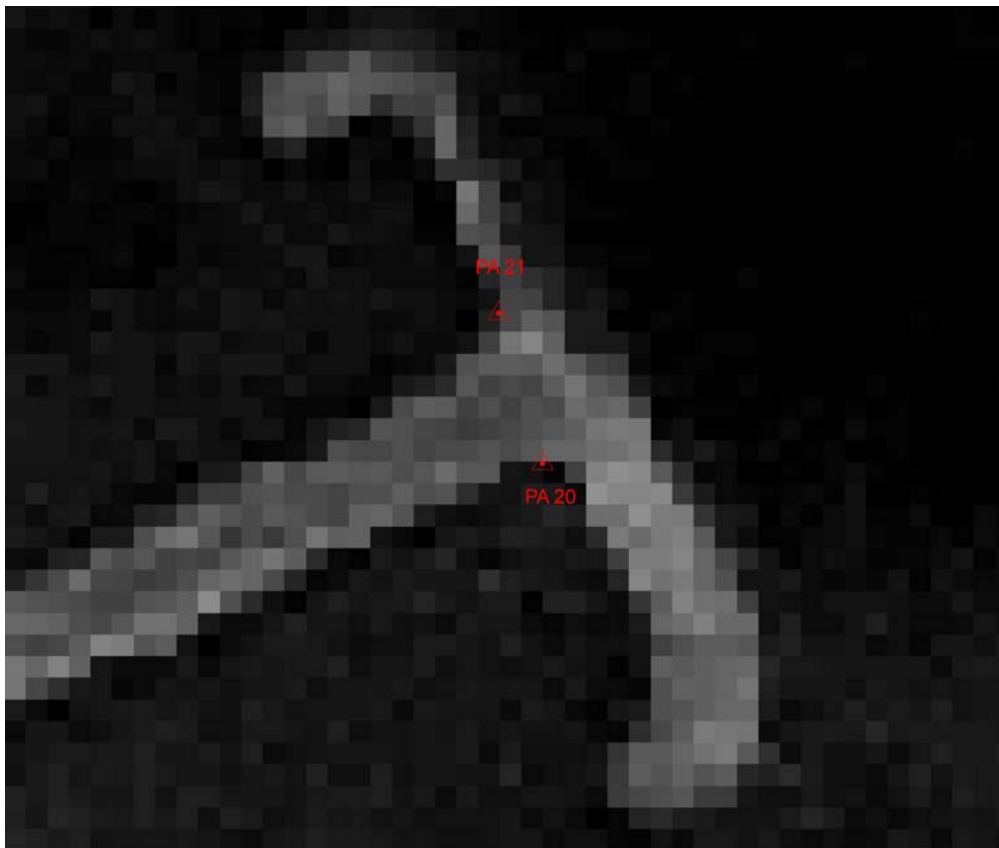
GCP_20_A.jpg (close-up photo looking east)



GCP_20_B.jpg (photo looking east)



PA21_20_far.jpg



PA21_20_close.jpg

Ngerechur Jetty, Ngarchelong

Date (UTC): 096

Northing: 857378.678

ID: PA21

Easting: 458475.417

Description: Carbonate rock jetty at the rock water interface. T-shaped jetty. Point 8.8 ft from east edge of rubble and 25.7 ft from PA 20.



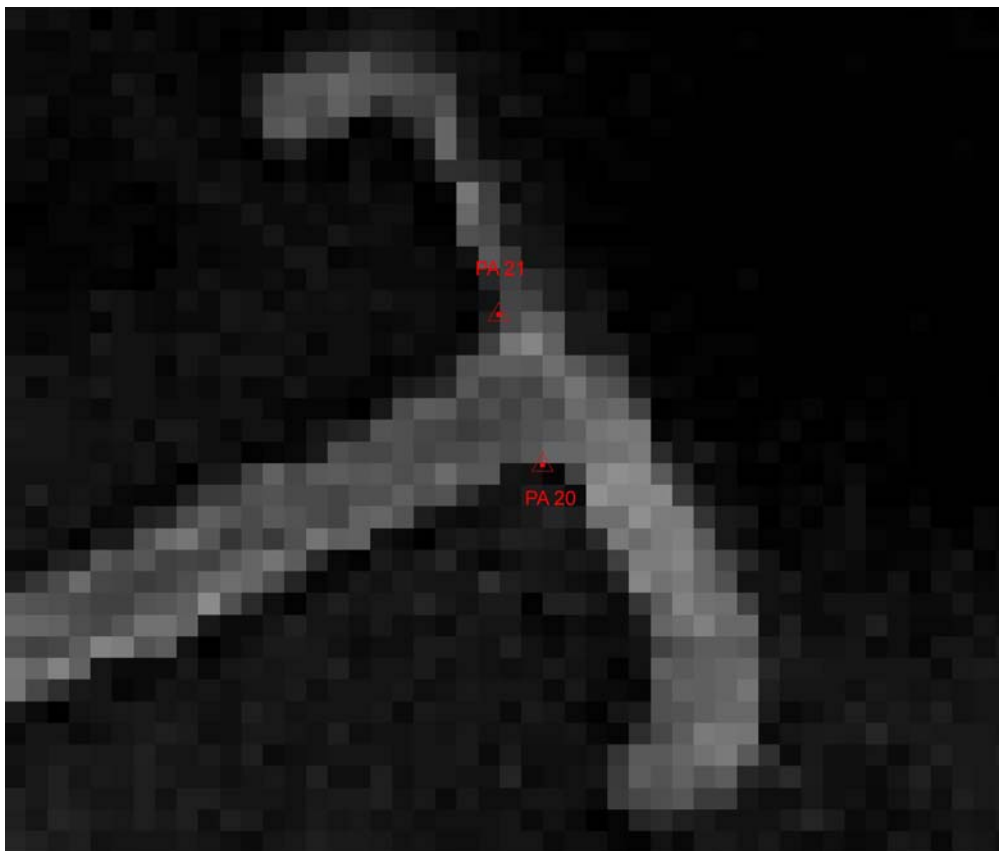
GCP_21_A.jpg (close-up photo looking south)



GCP_21_B.jpg (photo looking east)



PA21_20_far.jpg



PA21_20_close.jpg

Fisheries Dock Ballard, Kayangel

Date (UTC): 096

Northing: 893417.800

ID: PA6

Easting: 468693.959

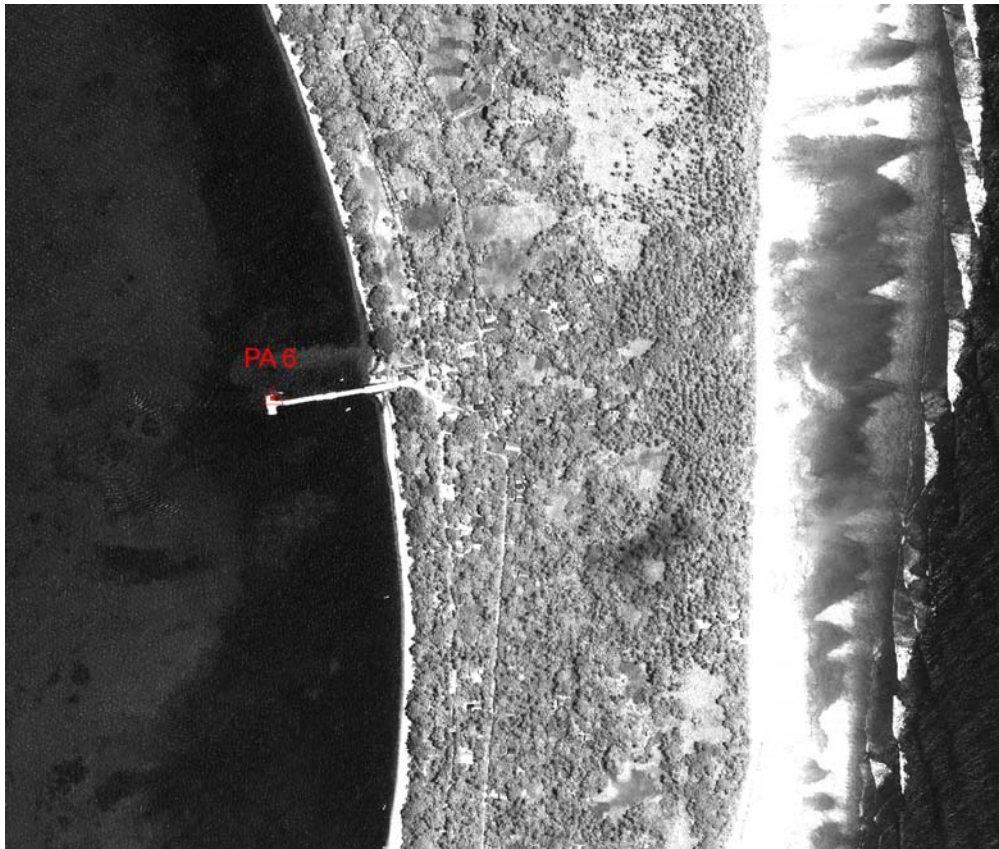
Description: Ballard at the NE corner of the concrete pier. T-shaped pier. Point 2 ft from east edge and .9 in from north edge of pier.



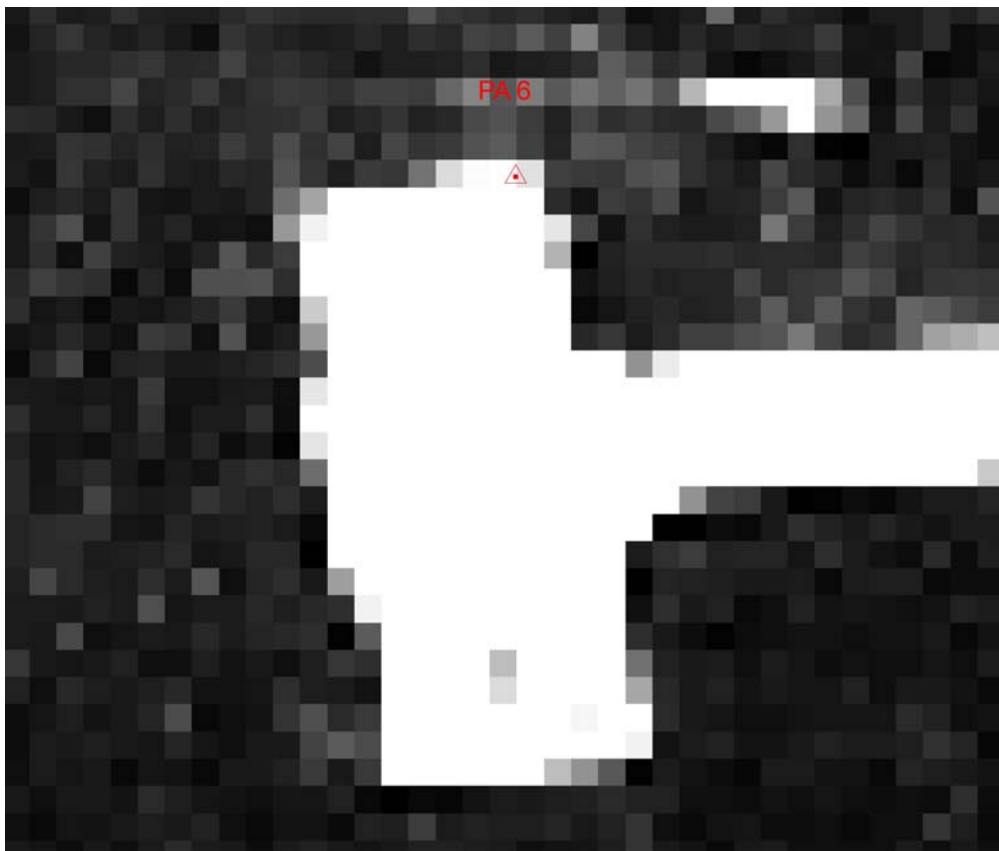
GCP_6_A.jpg (close-up photo looking east)



GCP_6_C.jpg (photo looking northeast)



PA6_far.jpg



PA6_close.jpg

Ice Generating Building, Kayangel

Date (UTC): 096

Northing: 893447.131

ID: PA7

Easting: 468830.032

Description: NW corner of concrete pad adjacent to storage shed west of ice house. Point 5.6 ft north of green gas shed.



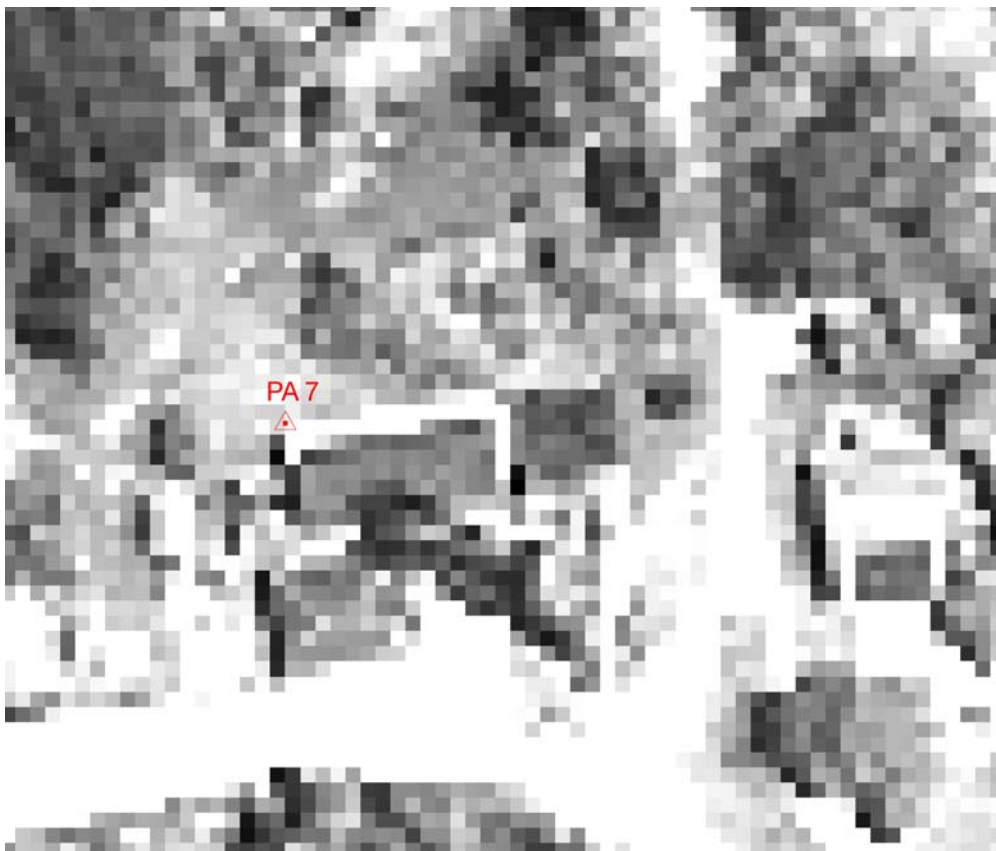
GCP_7_A.jpg (close-up photo looking south)



GCP_6_B.jpg (photo looking south)



PA7_far.jpg



PA6_close.jpg

Elementary School, Kayangel

Date (UTC): 096

Northing: 892771.309

ID: PA9

Easting: 468870.559

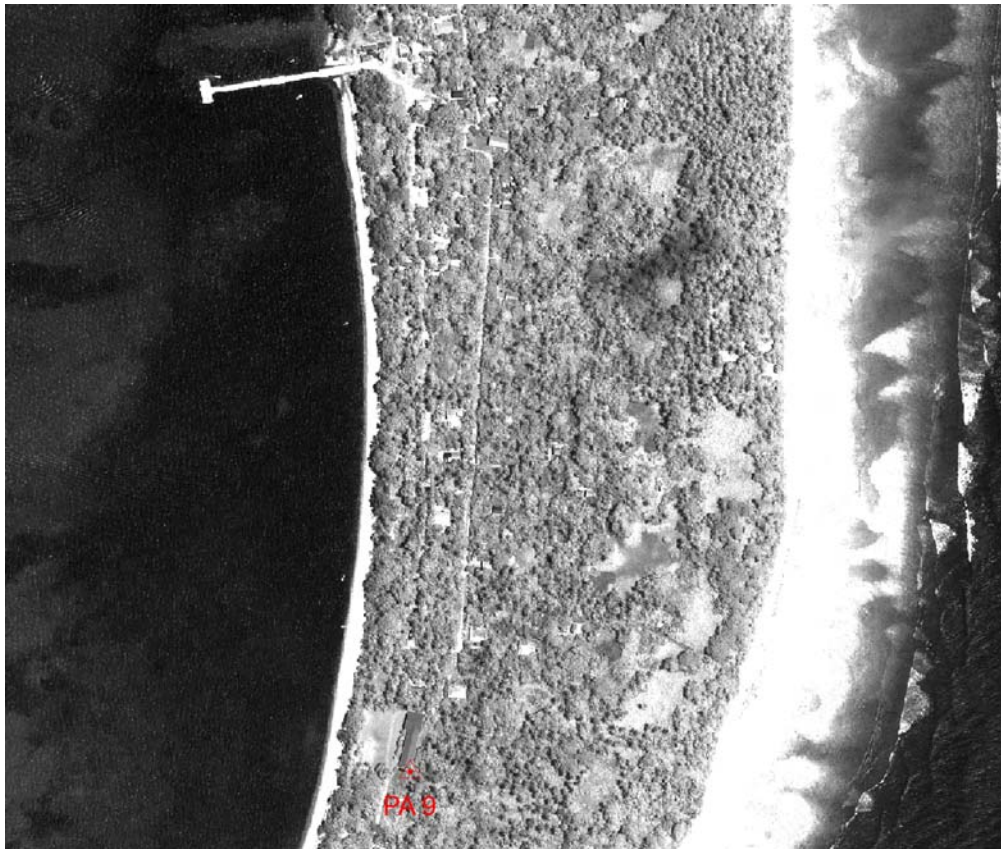
Description: NW corner of concrete flag pad. Pad dimensions 10.1 x 10.2 ft.



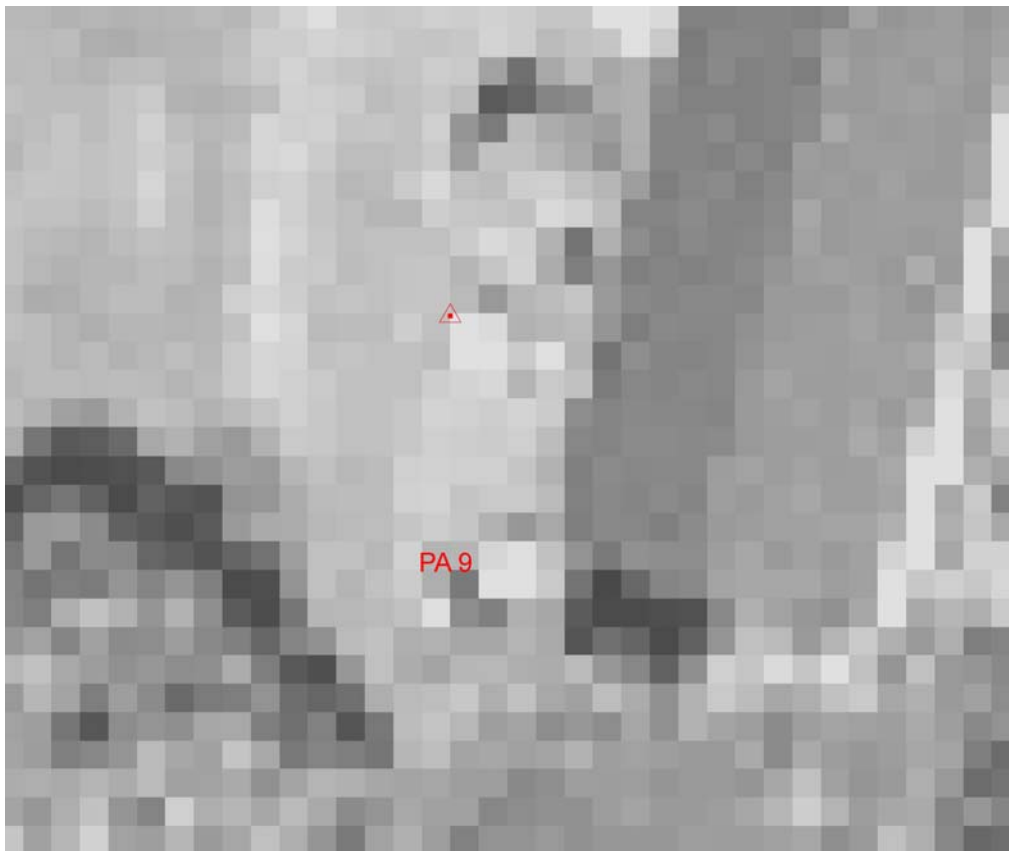
GCP_9_A.jpg (close-up photo looking south)



GCP_9_C.jpg (photo looking east)



PA9_far.jpg



PA9_close.jpg

Chiefs Meeting Lodge, Kayangel

Date (UTC): 096

Northing: 893351.238

ID: PA13

Easting: 468966.420

Description: Center of white cistern on south side of building. Cistern 5ft in diameter.



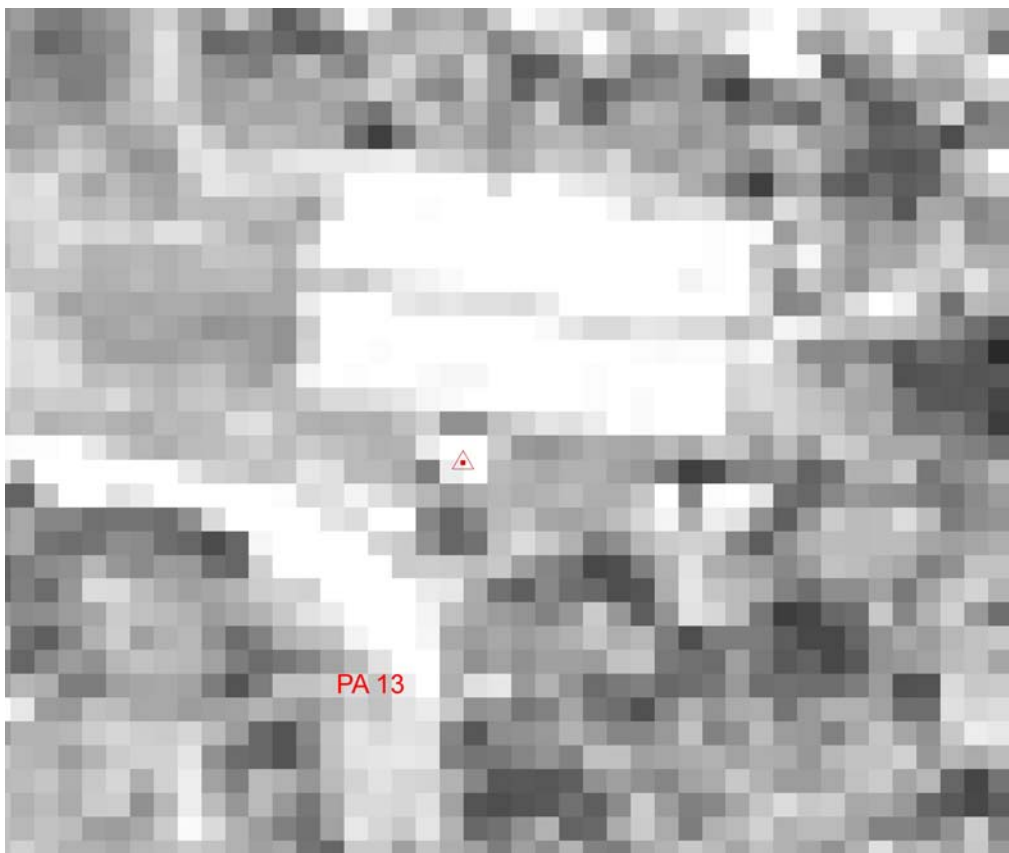
GCP_13_A.jpg (close-up photo looking north east)



GCP_13_B.jpg (photo looking east)



PA13_far.jpg



PA13_close.jpg

Power Plant, Kayangel

Date (UTC): 096

Northing: 893911.423

ID: PA16

Easting: 468760.614

Description: NW corner of concrete pad on northwest side of power plan. Pad 9.6 ft wide 15.4 ft long.



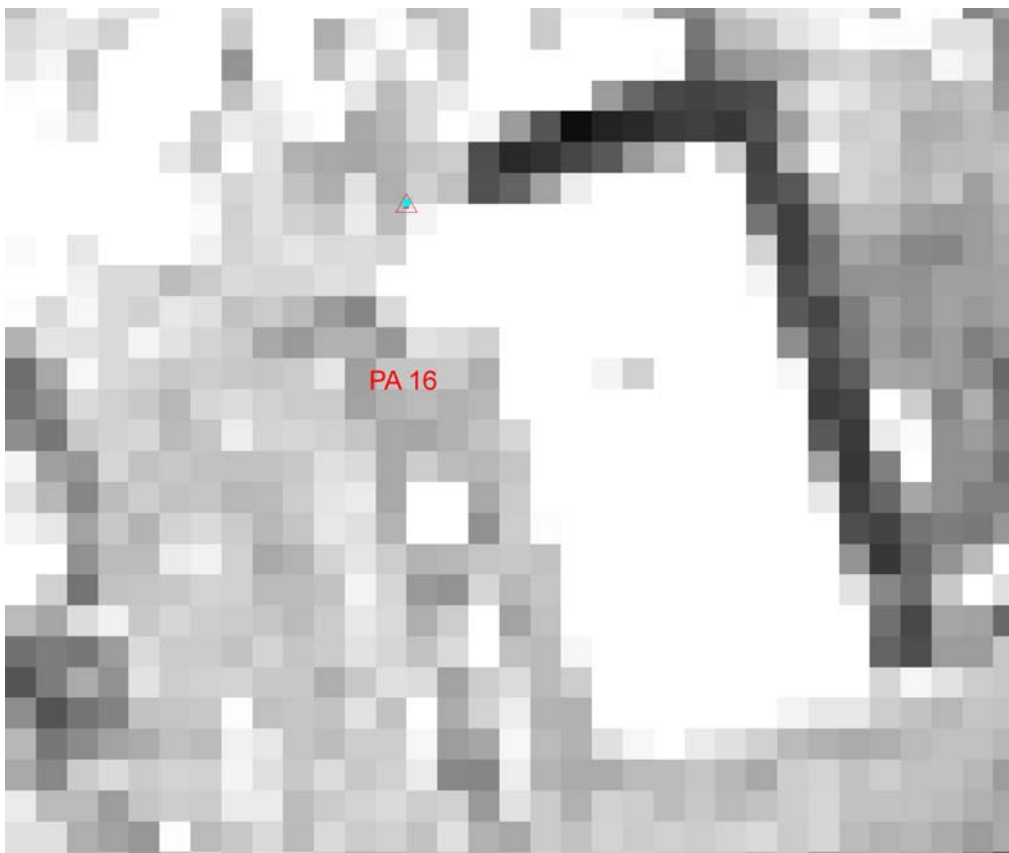
GCP_16_A.jpg (close-up photo looking south)



GCP_16_C.jpg (photo looking east)



PA16_far.jpg



PA16_close.jpg

Basketball Court, Kayangel

Date (UTC): 096

Northing: 893821.288

ID: PA26

Easting: 468802.965

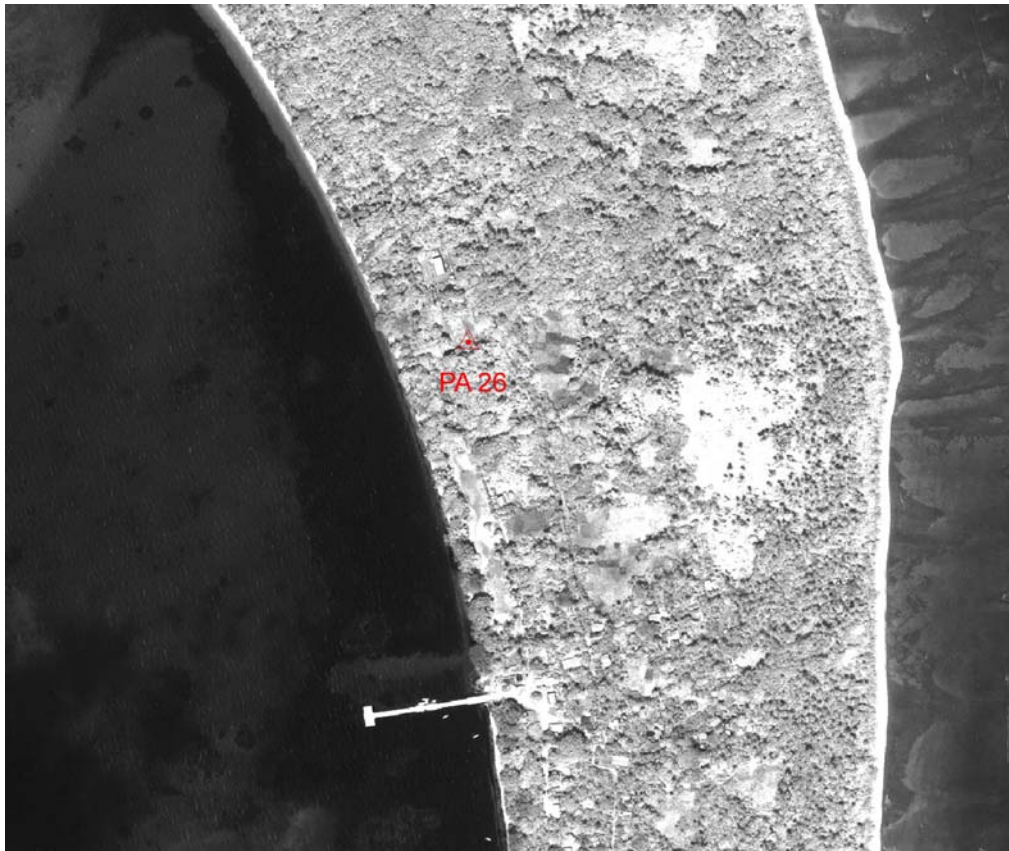
Description: SE corner of concrete basketball court, 2.3 ft from concrete.



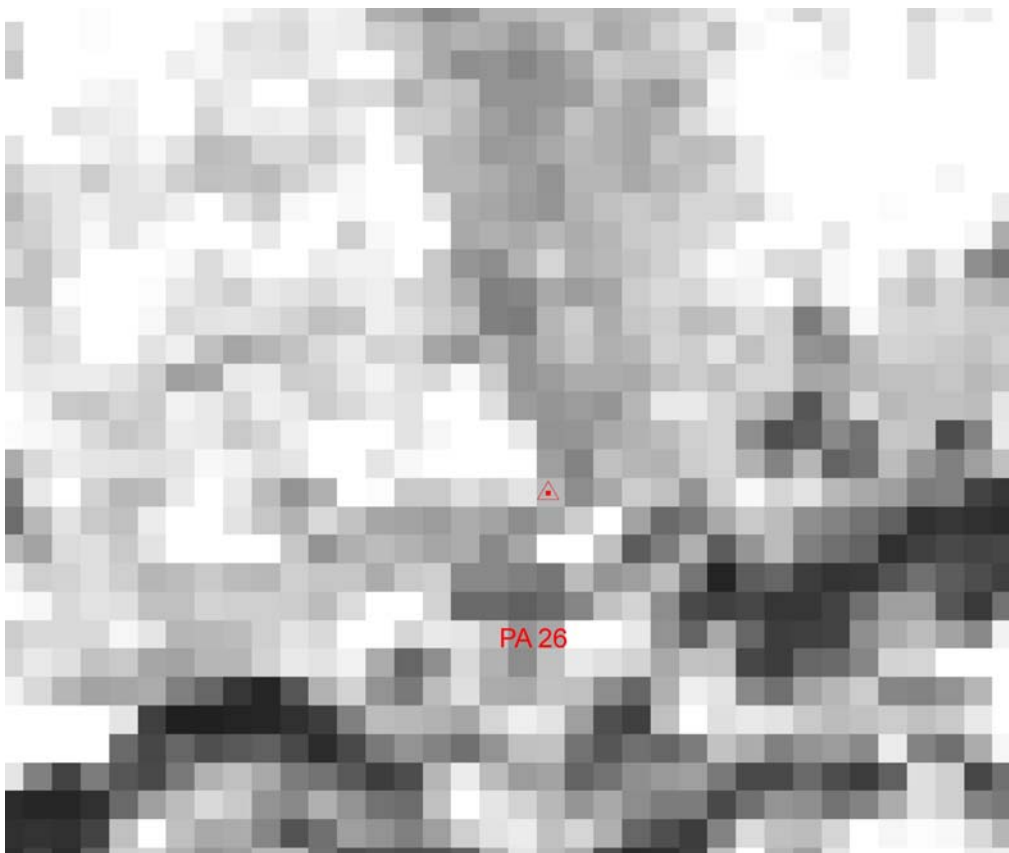
GCP_26_A.jpg (close-up photo looking southeast)



GCP_26_C.jpg (photo looking south)



PA26_far.jpg



PA16_close.jpg

Private House, Kayangel

Date (UTC): 096

ID: PA08

Northing: 892582.896

Easting: 468844.746

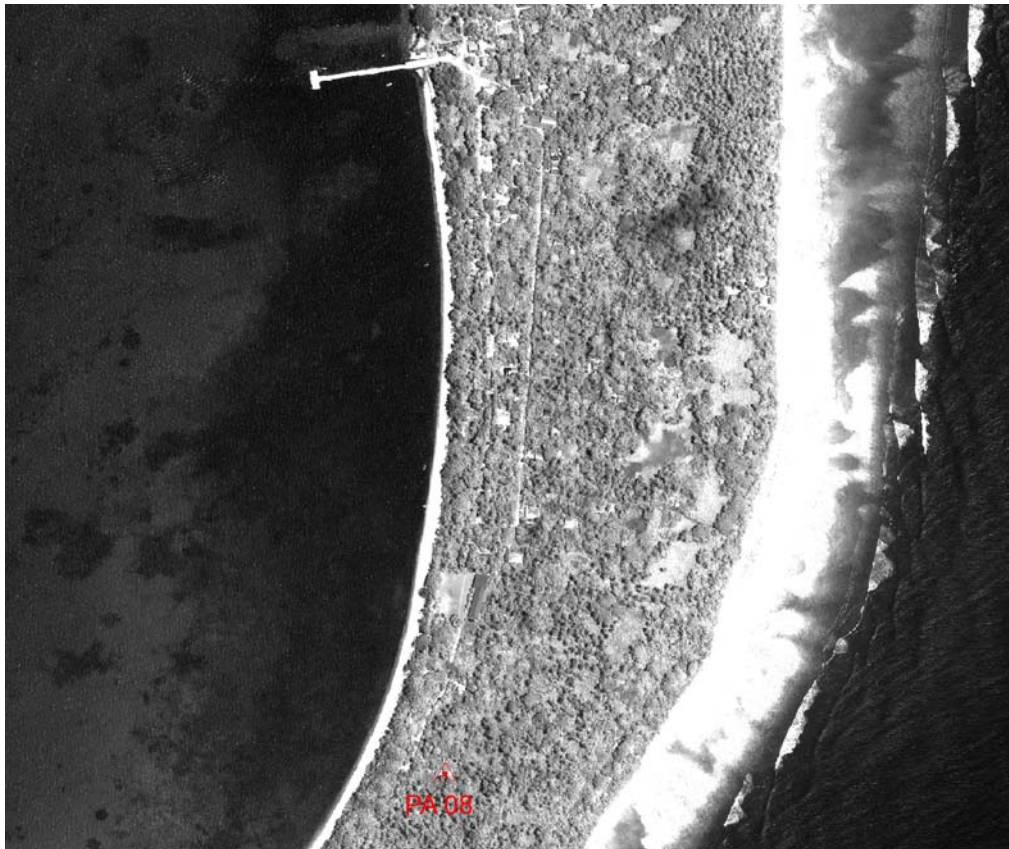
Description: NW corner of private house on the south side of island. 4 in offset from roof eave/gutter.



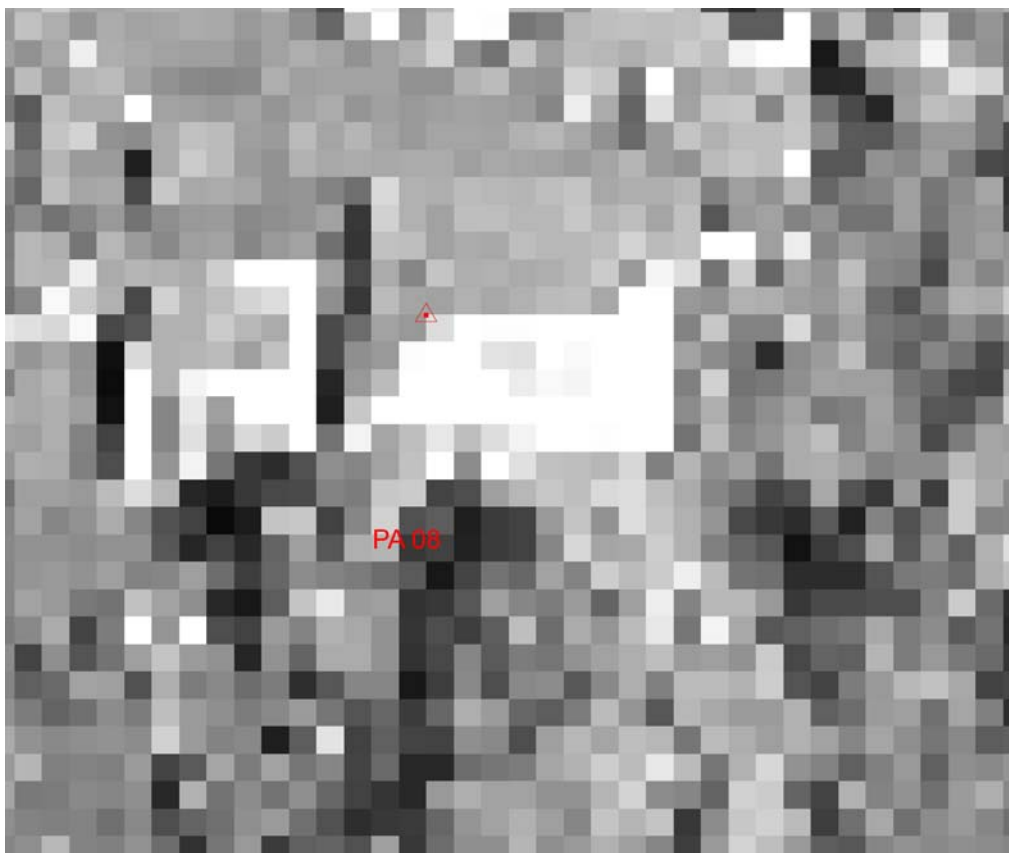
GCP_8_A.jpg (close-up photo looking south)



GCP_8_C.jpg (photo looking east)



PA8_far.jpg



PA8_close.jpg

Elder Meeting House, Kayangel

Date (UTC): 096

Northing: 893398.250

ID: PA27

Easting: 468891.107

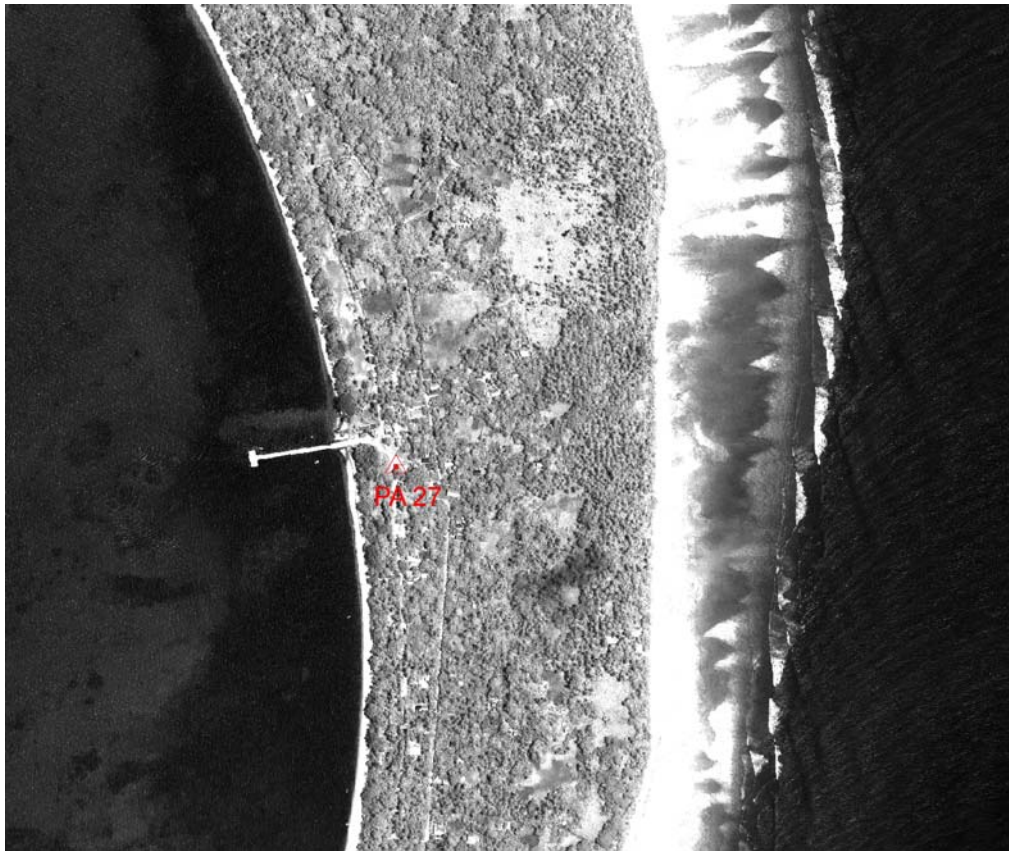
Description: NW corner of Elder meeting house.



GCP_27_A.jpg (close-up photo looking south)



GCP_27_C.jpg (photo looking southeast)



PA27_far.jpg



PA27_close.jpg

Shipwreck, Kayangel

Date (UTC): 097

Northing: 888797.501

ID: PA19

Easting: 466942.236

Description: West side of emergent shipwreck hull structure on the SW side of .Ngerebelas Island



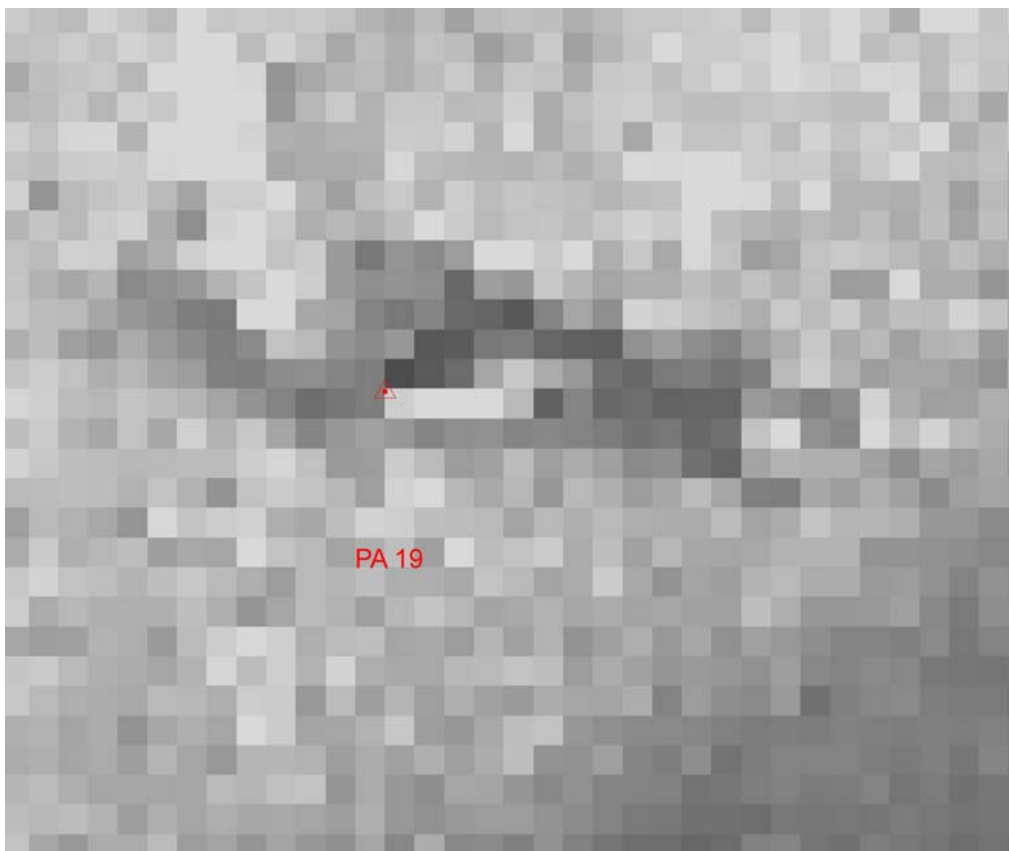
GCP_19_A.jpg (close-up photo looking east)



GCP_19_C.jpg (photo looking east)



PA19_far.jpg



PA19_close.jpg

Oketol Dock, Ngarchelong

Date (UTC): 097

Northing: 849778.803

ID: PA25

Easting: 458692.442

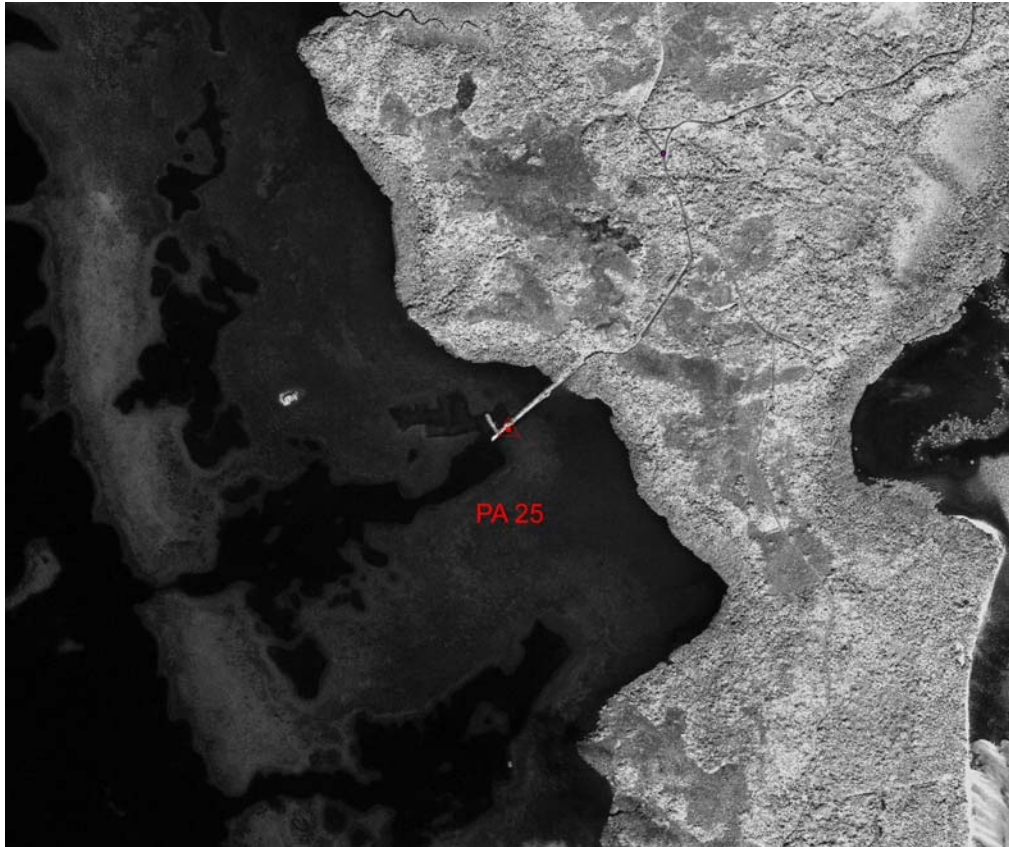
Description: SW intersection of cement gravel intersection of dock road.



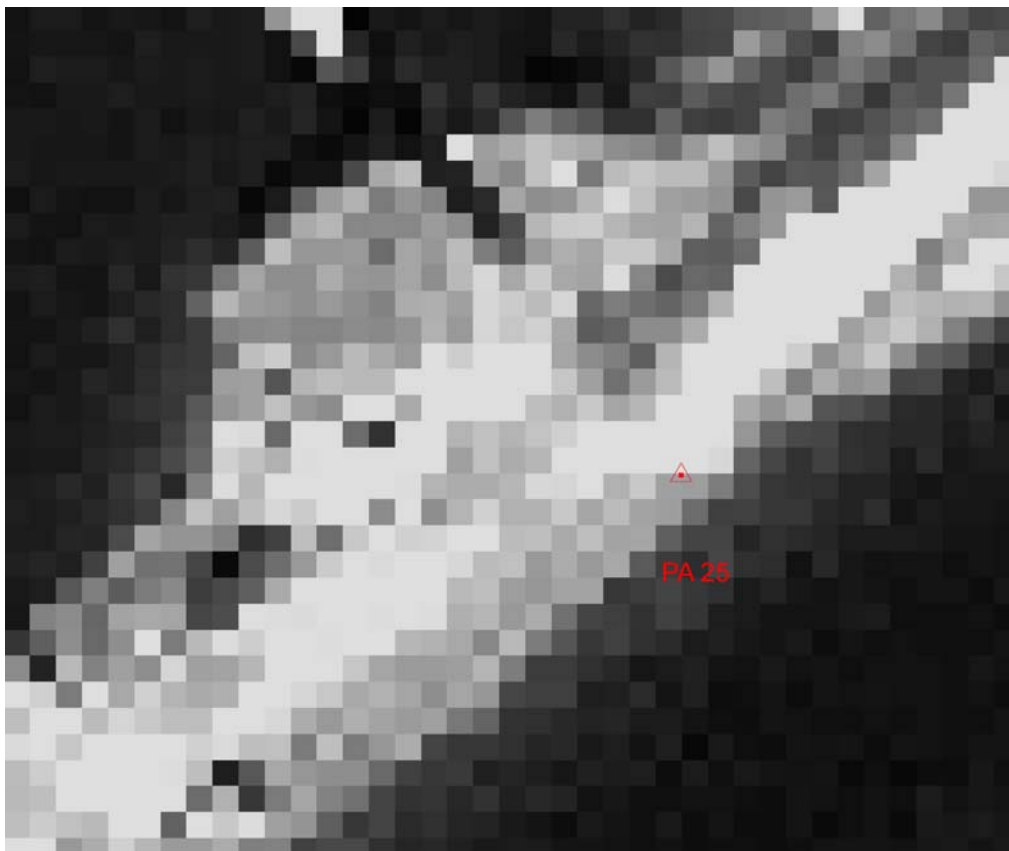
GCP_25_A.jpg (close-up photo looking east)



GCP_25_B.jpg (photo looking east)



PA25_far.jpg



PA25_close.jpg

Ngiwal Dock, Ngiwal

Date (UTC): 098

ID: PA28

Northing: 835021.940

Easting: 459999.453

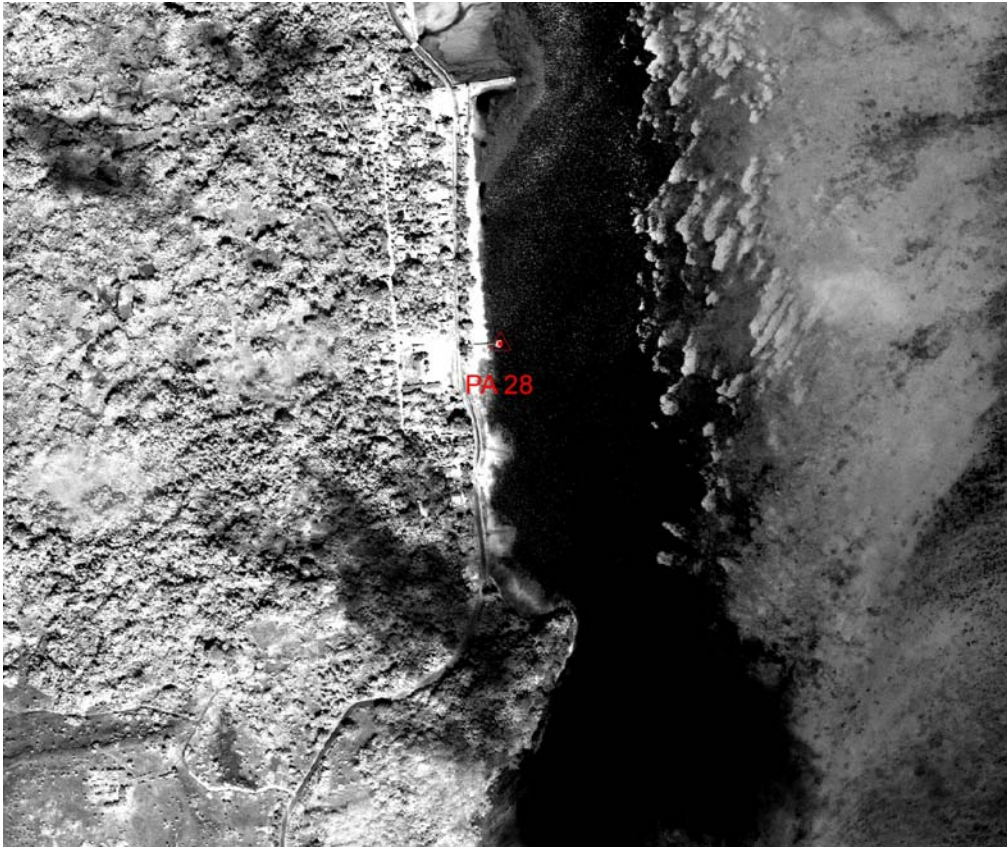
Description: NE corner of central concrete pier platform. Pole offset 2.2 ft and 2.0 ft from concrete east and north edges (incl side slope), respectively. New pier extension on east side with roof.



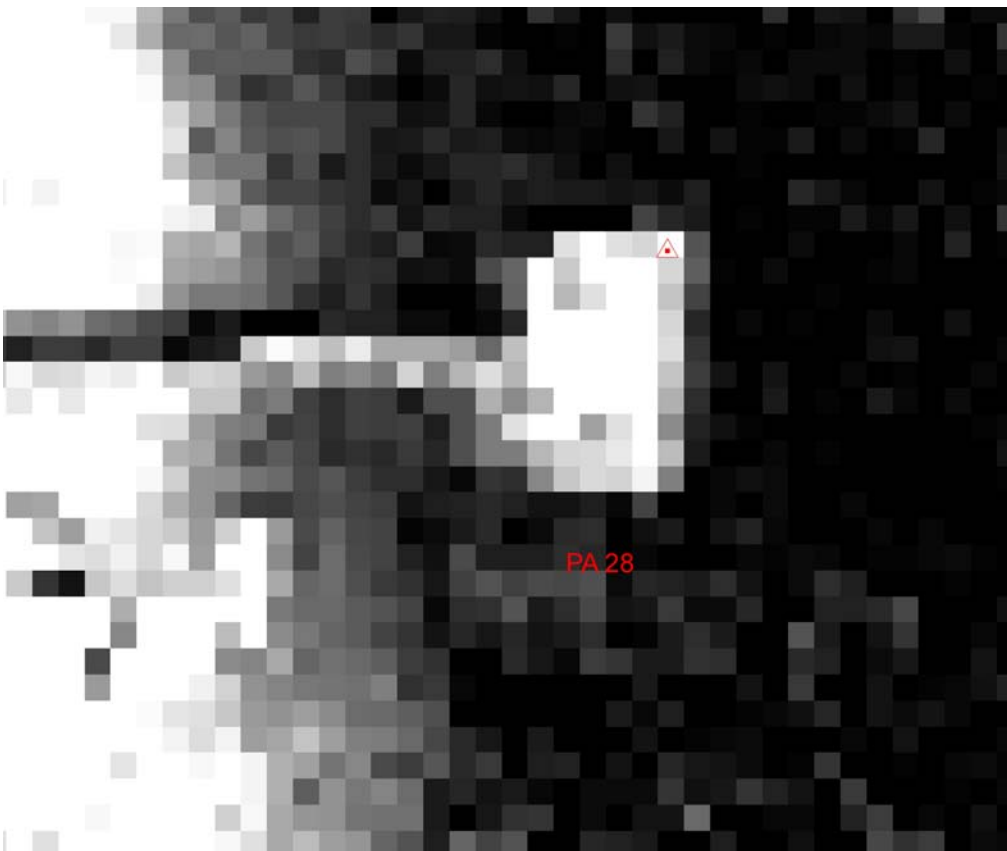
GCP_28_A.jpg (close-up photo looking north)



GCP_28_D.jpg (photo looking east)



PA28_far.jpg



PA28_close.jpg

Ngiwal Dock, Ngiwal

Date (UTC): 098

ID: PA29

Northing: 850287.786

Easting: 459540.800

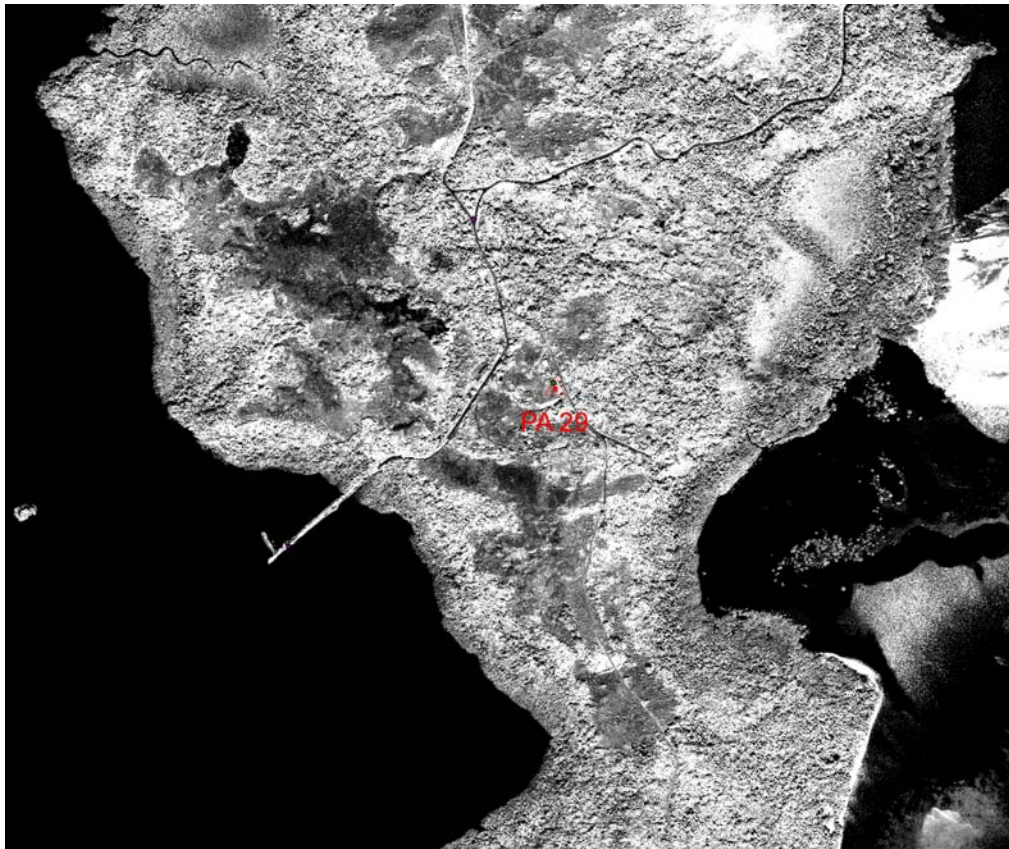
Description: NW corner of concrete basketball court at Ngerbau elementary school. Court 58 x 90 ft.



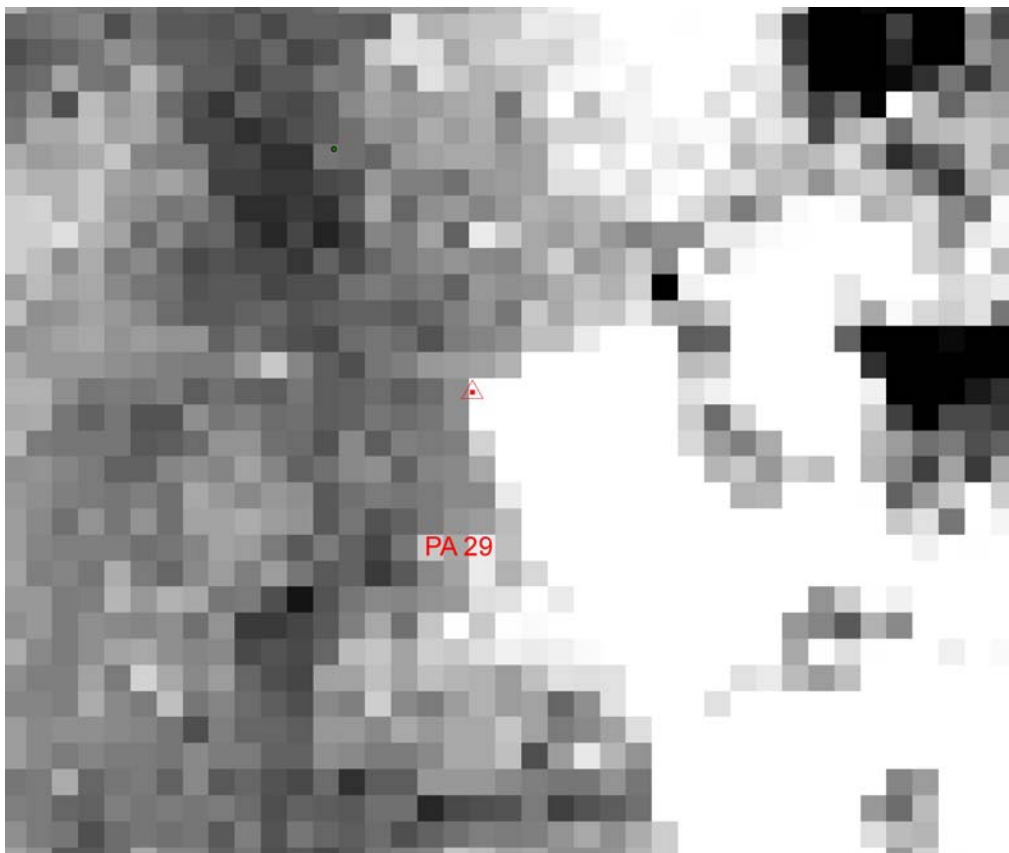
GCP_29_A.jpg (close-up photo looking west)



GCP_29_C.jpg (photo looking south)



PA29_far.jpg



PA29_close.jpg